ARS National Research Programs in Genomics and Genetics for Food Security

The Agricultural Research Service is a leader in developing and using genomic data to improve the development of agriculturally important animals, crops, ornamentals, insects, and microorganisms.

ARS's genomics research program is concentrated in three of the agency's national programs: Food Animal Production (NP #101), Plant Genetic Resources, Genomics, and Genetic Improvement (NP #301), and Plant Biological and Molecular Processes (NP #302). But genomics research has very broad applications, and research projects often involve extensive collaborations with other ARS national programs, such as Food Safety (NP #108), Animal Health (NP #103), Plant Diseases (NP #303), and Bioenergy and Energy Alternatives (NP #307). These and other national programs are described at www.nps.ars.usda.gov.

Sequencing genomes enormously expands our understanding as well as the number of genes that can be deployed to address aspects of better world food security and to increase sustainable food production. But such genome programs are too big and too expensive for any one agency—or even one country—to take on.

ARS continues to play a major role in forming the international committees and coalitions that select which genomes should be tackled next and ensuring that research tasks are complementary, not duplicative.

Because of the huge potential that genomics offers for improving crops, ARS has set a goal of developing genomic libraries with genotypic and phenotypic information for all accessions in the National Plant Germplasm System. This is a massive but accomplishable job.

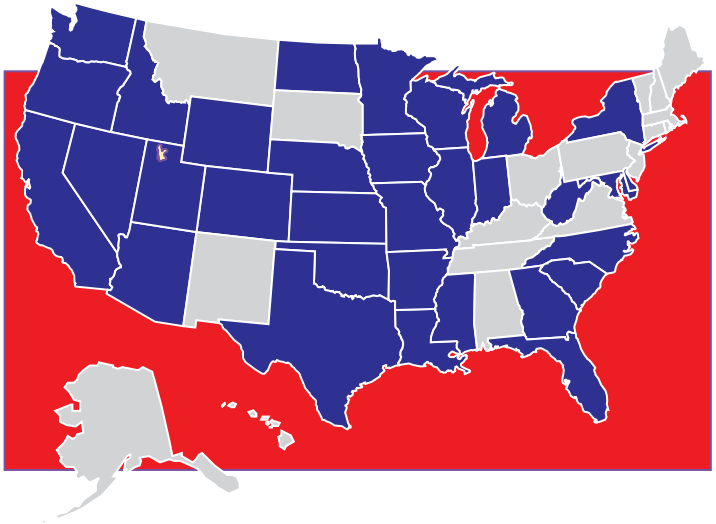
On the livestock and poultry side, ARS is leading a major effort to use genomics to improve the efficiency of animal production, especially in the area of feed utilization, to help reduce costs for producers and consumers, and to reduce the environmental impact of agriculture. Research projects will also be using genome sequence data to develop a better understanding of the host-pathogen relationship for the most dangerous animal pathogens and to enhance our understanding of the immune response to enable improved vaccines and postvaccine technologies.

ARS plant and animal genomics programs are also coordinating the development of new informatics tools for management, collection, storage, retrieval, and analysis of the large data sets being generated by genomics. This coordination includes promoting the integration of "-omics" data with large-scale phenotypic studies and the development of software to incorporate genome-level data into national and international genetic evaluation programs that support standards of interoperability, data validation, and quality assurance; and also promoting accessibility of the published data.

The goal is to maximize accessibility, utility, and use of genomics data; avoid duplication; and leverage developments from other research communities. ARS is also promoting the development and evaluation of technologies for rapid assessment of genomic diversity to guide the choice of candidates for whole-genome sequencing.

Food security is an international issue. The research to put genetics and genomics to work to enhance food security is also an international effort, one in which ARS plays a leading role. ✸

States Where ARS Does Plant Genomics Research



States Where ARS Does Animal Genomics Research